

II. Remarks

Reconsideration and allowance of the subject application are respectfully requested.

Claims 1 to 31 have been cancelled without prejudice or disclaimer. New claims 32 to 78 have been added. Claims 32 to 78 are now pending in the subject application. Claims 32, 54 and 69 are independent.

In the Official Action, the Examiner has raised an objection to the drawings. Replacement drawing sheets in compliance with 37 CFR 1.121(d) are submitted herewith.

The Examiner has rejected claims 1 to 12 and 16 to 25 under 35 U.S.C. §101 as being directed to non-statutory subject matter. The claims submitted herewith are believed to overcome this rejection. Accordingly, Applicants respectfully request that this rejection be removed.

With respect to prior art, the Examiner has rejected claims 1, 2, 4 to 6, 10 to 17, 26, 27, 30 and 31 under 35 U.S.C. §102(a) as being anticipated by U.S. Patent Application Publication No. 2003/0225325 to Kagermeier et al. ("Kagermeier"). Claims 3 and 7 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Kagermeier in view of U.S. Patent No. 6,310,477 to Schneider ("Schneider"). Claims 8, 9 and 18 to 21 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Kagermeier in view of Schneider and U.S. Patent Application Publication No. 2003/0135119 to Lee et al. ("Lee"). Claims 12, 16, 22 to 25, 28 and 29 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Kagermeier. Applicants respectfully submit that the Examiner's rejections in view of the cited references are no longer appropriate for the reasons set forth below.

Independent claim 1 recites a method of registering a needle in a patient target volume in an ultrasound imaging system, comprising capturing a first ultrasound image of the patient target volume using an ultrasound probe prior to insertion of the needle into the patient target volume; capturing a second ultrasound image of a sub-sector of the patient target volume using the ultrasound probe after insertion of the needle in the patient target volume, the sub-sector corresponding generally to a predicted trajectory of the needle within the patient target volume; computing the actual trajectory of the needle in the patient target volume using a

computing device based on differences detected between the first and second ultrasound images; and with the actual needle trajectory computed, computing at least one of a needle tip location and an entry location of the needle into the patient target volume.

In contrast, Kagermeier discloses a method for repositioning a patient in a diagnostic/therapeutic system, as well as to such a system, wherein a repeated, accurate repositioning is achieved by producing difference images from a reference image and a current image, each in two recording axes, which are independent of each other, and by subsequently minimizing the visible differences. The reference images are produced with the same camera setting as the current images. As the Examiner will appreciate, Kagermeier has nothing to do with registration of a needle inserted into a patient target volume. Accordingly, Applicants respectfully request that the Examiner's rejections in view of Kagermeier be removed.

The remaining references fail to remedy the deficiencies of Kagermeier. Schneider discloses a 3D MR image that is acquired before injection of a contrast agent and an enhanced 3D image that is acquired after injection of the contrast agent. The two images are registered and then subtracted to remove background and to highlight lesion voxels. Lesion objects are identified by connecting contiguous lesion objects. Volume and surface area of any continuous lesion object in a discrete digital image are then calculated. Malignant lesions are identified by determining the ratio of volume to surface area for each lesion object. Malignant tumors are identified when this ratio drops below a preset threshold. Similar to Kagermeier, Schneider has nothing to do with registration of a needle inserted into a patient target volume. Combining Kagermeier and Schneider therefore simply does not lead one of ordinary skill in the art to the Applicants' invention as claimed. Accordingly, Applicants respectfully request that the Examiner's rejection in view of Kagermeier and Schneider be removed.

Lee discloses a method and apparatus for enabling a biopsy needle to be observed in a three-dimensional ultrasound diagnostic system using an interventional ultrasound system. The apparatus comprises an ultrasound transducer, a three-dimensional image-forming section, a section for extracting a target object, a location-calculating section, a display section, and a controller. The method comprises the steps of acquiring a two-dimensional ultrasound image of a subject; generating a three-dimensional volume image based on the two-dimensional ultrasound

image; segmenting a target image, which corresponds to a target object within the subject, from the three-dimensional volume image; displaying a guide line of the biopsy guide on the segmented target image; extracting the segmented target image; acquiring information on a location of the biopsy needle by reference to the segmented target image; calculating an error based on the information; and displaying a guiding status of the biopsy needle based on the calculated error.

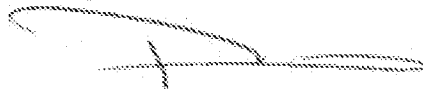
Although Lee discloses a method of observing a needle, Lee fails to teach or suggest the Applicants' invention as claimed. Lee extracts the needle by segmenting a three-dimensional volume image. As the Examiner will appreciate, Lee does not capture an ultrasound image of the target volume prior to insertion of the needle and then capture an ultrasound image of a sub-sector of the target volume after insertion of the needle with the sub-sector corresponding to a predicted needle trajectory within the target volume as claimed. Lee also does not compute an actual needle trajectory based on differences of the target volume and target volume sub-sector ultrasound images as claimed. Combining Kagermeier, Schneider and Lee therefore simply does not lead one of ordinary skill in the art to the Applicants' invention as claimed. Accordingly, Applicants respectfully request that the Examiner's rejection in view of Kagermeier, Schneider and Lee be removed.

Based on the above, Applicants respectfully submit that independent claim 32 and the claims dependent thereon distinguish patentably over the cited references and should be allowed. Independent claims 54 and 69 and the claims dependent thereon are also believed to distinguish patentably over the cited references at least for the same reasons set forth above and should also be allowed.

In view of the above, it is believed the application is in order for allowance and action to that end is respectfully requested.

Respectfully submitted,

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Dated: June 24, 2009

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